Meridian 1

Spares Planning

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Revision history

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Standard 15.00. This document is up-issued to support Meridian 1 Release 25.40 systems. This document is up-issued to include Call Processor Pentium (CP PII) and Fibre Network Fabric (FNF) for Option 81C.

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Standard 14.00. This is a global document and is up-issued for X11 Release 25.0x. Document changes include removal of: redundant content; references to equipment types except Options 11C, 51C, 61C, and 81C; and references to previous software releases.

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Standard 13.00. This document is reissued to include he NT5D03 Call Processor Card and minor edits. Changes to technical content are noted by revision bars in the margins.

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Standard 12.00. Changes are noted by revision bars in the margins.

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Standard 10.00. This document is reissued to include the Fiber Remote Multi-IPE units. Changes to technical content are noted by revision bars in the margins.

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December 1994

Standard, 7.0. This document is reissued to include Small Systems Multi Disk Unit (SMDU), option 51C, and failure rate information updates. Changes to technical content are noted by revision bars in the margins.

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Standard 6.0. This document is reissued to include information on Meridian 1 system option 61C. New information and changes to technical content are noted by revision bars in the margins.

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Standard 5.0.

December 1992

Standard 4.0. This document is reissued to include information on system option 81 and equipment required for compatibility with X11 release 18. New information and changes to technical content are noted by revision bars in the margins.

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Standard 3.0. This document is reissued to include technical content updates. Due to the extent of changes revision bars are omitted.

December 1990

Standard 2.0. Reissued to include MTBF information for station equipment.

January 1990

Standard 1.0.

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About this document

This document applies to Meridian 1 Internet Enabled systems.

This document is a global document. Contact your system supplier or your Nortel Networks representative to verify that the hardware and software described is supported in your area.

This document provides the information needed to calculate and plan for spare (replaceable) equipment. This guide also provides hardware failure rates.

Who should use this document

This document is intended for individuals responsible for system administration.

Spares planning

Content

The following are the topics in this section:

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Definitions and assumptions

Failure rate—Failure rate equals the estimated number of failures for that item during one million (10^6) hours of operation. The only exception is to measurements for cabling or other items with low failure rates. Rates are also measured in Failures in Time (FIT) measurements. One FIT equals one billion (10^9) hours of operation.

Sparing interval—The sparing interval is the period of time that stocks of replaceable items should last without being replenished. This period is assumed to be one year following the installation of the system.

Stock confidence level—The stock confidence level is the allowed probability of not being out of stock when the sparing interval of one year is greater than 99.9 percent.

Card ambient temperature—The card ambient temperature is the average temperature of the air immediately surrounding the circuit card (usually higher than the ambient room temperature). Card failure rates in this document are based on a card ambient temperature of 40° C (104° F).

Turnaround time for repair—Equipment may be serviced at a repair house or at a centralized depot that serves subdepots. The turnaround time for the return-to-stock of a failed item is about ten working days (240 hours) from a repair house. The turnaround time for the return-to-stock of a failed item is about two working days from a centralized depot.

Actual turnaround periods vary in the field. As the number of systems served increases, the percentage of replaceable items required in stock is reduced.

Population range—Population range is the quantity of each type of system in the area served by the depot.

Spare stock size—The quantity of spares for a given stock item depends on the sparing interval, stock confidence level, failure rate, turnaround time for repair, and population range.

Procedure 1
Calculating spares requirements

Use the following procedure to calculate the number of spares required to stock a depot for a one-year sparing interval:

1. Determine the number (N) of in-service specified circuit cards serviced by the depot.
2. Look up the card failure rate (F) for the specified circuit card in “Failure rates” on page 19.
3. Card failure rates are expressed in terms of the number of failures per million hours (10^6).
4. Determine turnaround time (T) in hours.
5. For repair house service, turnaround time is typically ten working days (240 hours). For centralized depot service, turnaround time is typically two working days (48 hours).
6. Calculate the NFT value by multiplying N x F x T.
7. Look up the number of spares required in “NFT values” on page 13.

Example: A centralized depot services 10,000 NT8D02 Digital Line Cards. The failure rate given for this card is 1.8 failures per 1 million hours. With a turnaround time of 48 hours:

$$NFT = 10{,}000 \times \frac{1.8}{1{,}000{,}000} \times 48 = 0.864$$

The number of spares required for an NFT value of 0.864 = 6.

NFT values

Table 1 on page 13 translates NFT values to the number of spares required in stock. The following abbreviations are used:

N—Number in use

F—Failure rate

T—Turnaround time (in hours)

Table 1
Number of spares required (Part 1 of 7)

NFT values		Number of spares	NFT values		Number of spares
From	To		From	To	
0	0.001	1	5.16	5.76	15
0.001	0.0452	2	5.76	6.37	16
0.0452	0.189	3	6.37	6.99	17
0.189	0.425	4	6.99	7.62	18
0.425	0.734	5	7.62	8.26	19
0.734	1.09	6	8.26	8.91	20
1.09	1.5	7	8.91	9.57	21
1.5	1.95	8	9.57	10.2	22
1.95	2.43	9	10.2	10.9	23
2.43	2.94	10	10.9	11.5	24

Table 1
Number of spares required (Part 2 of 7)

NFT values		Number of spares
From	To	
2.94	3.46	11
3.46	4.01	12
4.01	4.58	13
4.58	5.16	14
14.3	15	29
15	15.8	30
15.8	16.5	31
16.5	17.2	32
17.2	17.9	33
17.9	18.7	34
18.7	19.4	35
19.4	20.1	36
20.1	20.9	37
20.9	21.6	38
21.6	22.4	39
22.4	23.1	40
23.1	23.9	41
23.9	24.6	42
24.6	25.4	43
25.4	26.2	44
26.2	26.9	45

NFT values		Number of spares
From	To	
11.5	12.2	25
12.2	12.9	26
12.9	13.6	27
13.6	14.3	28
34.7	35.5	56
35.5	36.3	57
36.3	37.1	58
37.1	37.9	59
37.9	38.7	60
38.7	39.5	61
39.5	40.3	62
40.3	41.1	63
41.1	41.9	64
41.9	42.7	65
42.7	43.5	66
43.5	44.3	67
44.3	45.2	68
45.2	46	69
46	46.8	70
46.8	47.6	71
47.6	48.4	72

Table 1
Number of spares required (Part 3 of 7)

NFT values		Number of spares
From	To	
26.9	27.7	46
27.7	28.5	47
28.5	29.2	48
29.2	30	49
30	30.8	50
30.8	31.6	51
31.6	32.4	52
32.4	33.2	53
33.2	33.9	54
33.9	34.7	55
56.6	57.5	83
57.5	58.3	84
58.3	59.1	85
59.1	60	86
60	60.8	87
60.8	61.6	88
61.6	62.5	89
62.5	63.3	90
63.3	64.1	91
64.1	65	92
65	65.8	93

NFT values		Number of spares
From	To	
48.4	49.2	73
49.2	50	74
50	50.9	75
50.9	51.7	76
51.7	52.5	77
52.5	53.3	78
53.3	54.2	79
54.2	55	80
55	55.8	81
55.8	56.6	82
79.3	80.2	110
80.2	81	111
81	81.9	112
81.9	82.7	113
82.7	83.6	114
83.6	84.4	115
84.4	85.3	116
85.3	86.2	117
86.2	87	118
87	87.9	119
87.9	88.7	120

Table 1
Number of spares required (Part 4 of 7)

NFT values		Number of spares
From	To	
65.8	66.6	94
66.6	67.5	95
67.5	68.3	96
68.3	69.2	97
69.2	70	98
70	70.9	99
70.9	71.7	100
71.7	72.5	101
72.5	73.4	102
73.4	74.2	103
74.2	75.1	104
75.1	75.9	105
75.9	76.8	106
76.8	77.6	107
77.6	78.5	108
78.5	79.3	109
102.5	103.4	137
103.4	104.3	138
104.3	105.1	139
105.1	106	140
106	106.9	141

NFT values		Number of spares
From	To	
88.7	89.6	121
89.6	90.4	122
90.4	91.3	123
91.3	92.2	124
92.2	93	125
93	93.9	126
93.9	94.7	127
94.7	95.6	128
95.6	96.5	129
96.5	97.3	130
97.3	98.2	131
98.2	99.1	132
99.1	99.9	133
99.9	100.8	134
100.8	101.7	135
101.7	102.5	136
126.1	127	164
127	127.8	165
127.8	128.7	166
128.7	129.6	167
129.6	130.5	168

Table 1
Number of spares required (Part 5 of 7)

NFT values		Number of spares
From	To	
106.9	107.7	142
107.7	108.6	143
108.6	109.5	144
109.5	110.3	145
110.3	111.2	146
111.2	112.1	147
112.1	113	148
113	113.8	149
113.8	114.7	150
114.7	115.6	151
115.6	116.4	152
116.4	117.3	153
117.3	118.2	154
118.2	119.1	155
119.1	119.9	156
119.9	120.8	157
120.8	121.7	158
121.7	122.6	159
122.6	123.5	160
123.5	124.3	161
124.3	125.2	162

NFT values		Number of spares
From	To	
130.5	131.4	169
131.4	132.2	170
132.2	133.1	171
133.1	134	172
134	134.9	173
134.9	135.8	174
135.8	136.6	175
136.6	137.5	176
137.5	138.4	177
138.4	139.3	178
139.3	140.2	179
140.2	141.1	180
141.1	141.9	181
141.9	142.8	182
142.8	143.7	183
143.7	144.6	184
144.6	145.5	185
145.5	146.4	186
146.4	147.3	187
147.3	148.1	188
148.1	149	189

Table 1
Number of spares required (Part 6 of 7)

NFT values		Number of spares
From	To	
125.2	126.1	163
149.9	150.8	191
150.8	151.7	192
151.7	152.6	193
152.6	153.5	194
153.5	154.4	195
154.4	155.2	196
155.2	156.1	197
156.1	157	198
157	157.9	199
157.9	158.8	200
158.8	159.7	201
159.7	160.6	202
160.6	161.5	203
161.5	162.4	204
162.4	163.3	205
163.3	164.1	206
164.1	165	207
165	165.9	208
165.9	166.8	209
166.8	167.7	210
182	182.9	227
182.9	183.8	228
183.8	184.7	229
184.7	185.6	230
185.6	186.5	231
186.5	187.4	232
187.4	188.3	233
188.3	189.2	234
189.2	190.1	235
190.1	191	236
191	191.9	237

Table 1
Number of spares required (Part 7 of 7)

NFT values		Number of spares
From	To	
167.7	168.6	211
168.6	169.5	212
169.5	170.4	213
170.4	171.3	214
171.3	172.2	215
172.2	173.1	216
173.1	174	217
198.2	199.1	245
199.1	200	246
200	200.9	247
200.9	201.8	248
201.8	202.7	249
202.7	203.6	250
203.6	204.5	251
204.5	205.4	252
205.4	206.3	253
206.3	207.2	254
207.2	208.1	255
208.1	209	256

NFT values		Number of spares
From	To	
191.9	192.8	238
192.8	193.7	239
193.7	194.6	240
194.6	195.5	241
195.5	196.4	242
196.4	197.3	243
197.3	198.2	244

Failure rates

The following tables list replaceable equipment and provide failure rates for that equipment:

- Table 2, “Failure rates of modules, and packaging,” on page 20
- Table 3, “Failure rates of power and cooling equipment,” on page 21
- Table 4, “Failure rates of circuit cards,” on page 22
- Table 5, “Failure rates of mass storage equipment,” on page 28
- Table 6, “Failure rates of station equipment,” on page 29

Reference list

The following are the references in this section:

- *Equipment Identification* (553-3001-154)

Note: “N/A” indicates the failure rate is not available at this time.

The failure rates are based on a circuit card ambient temperature of 40° C (104° F). This temperature is usually higher than the surrounding room temperature. Running the system at a lower temperature will increase the life expectancy of components and improve overall system reliability.

There are many cables available from Nortel Networks. The approximate failure rate for most cables, based on failures in time per billion hours (10^9), is 0.5. For a detailed listing of cables, see *Equipment Identification* (553-3001-154).

Table 2
Failure rates of modules, and packaging

Order code	Description	Failure rate per 10^6 hrs
A773056 A773059	Fiber Remote Multi-IPE Single-mode (1-4 Superloops) (1-2 Superloops)	1.86
A773054 A773055	Fiber Remote Multi-IPE Multi-mode (1-4 Superloops) (1-2 Superloops)	1.86
A0634492 A0634493	Fiber Remote Multi-IPE Redundant Option, Single-mode Multi-mode	1.86
NT5D21AA NT5D21DA	Core/Network Module AC Core/Network Module DC	0.25
NT7D00AA NT7D00BA	Top Cap (AC) Top Cap (DC)	0.14
NT8D35AA NT8D35DC	Network Module AC Network Module DC	0.90
NT8D37AA NT8D37DC	Intelligent Peripheral Equipment (IPE) Module AC IPE Module DC	0.80

Table 3
Failure rates of power and cooling equipment

Order code	Description	Failure rate per 10^6 hrs
A0355200	Power Failure Transfer Unit	5.70
NT6D40	PE Power Supply DC	1.60
NT6D41	CE Power Supply DC	0.61
NT8D06	PE Power Supply AC	2.10
NT8D21	Ringing Generator AC	2.02
NT8D22	System Monitor	1.00
NT8D29	CE Power Supply AC	1.27
NT8D52AB	Pedestal Blower Unit AC	2.00
NT8D52DD	Pedestal Blower Unit DC	N/A
NT8D53AB	Power Distribution Unit AC	N/A
NT8D53AD	Power Distribution Unit (option 21A)	N/A
NT8D56AA	CE Module Power Distribution Unit	N/A
NT8D56AC	CE/PE Module Power Distribution Unit	N/A
NT8D57AA	PE Module Power Distribution Unit	N/A
QBL12	Battery Distribution Box	1.33
QBL15	Power Distribution Box	2.81

Table 4
Failure rates of circuit cards (Part 1 of 6)

Order code	Description	Failure rate per 10^6 hrs
A0810496 A0786611	Call Processor Pentium II® (128 Mbytes)	N/A
NT1P61	Fibre Superloop Network Card	1.05
NT1P62	Fibre Controller Card	1.03
NT1P63	Electro-optical Interface	1.14
NT1R20	Off-Premises Station Analog Line Card	5.00
NT4N43AA	cPCI Multi-Media Disk Unit	N/A
NT4N64	Call Processor Pentium II® (256 Mbytes)	N/A
NT4N65AB	cPCI® Core to Network Interface	N/A
NT4N66AB	cPCI® Core to Network Interface Transition	N/A
NT4N67AA	System Utility	N/A
NT4N68AA	System Utility Transition	N/A
NT5D03AA	Call Processor Card (48 Mbytes)	N/A
NT5D03BA	Call Processor Card (64 Mbytes)	N/A
NT5D03CA	Call Processor Card (80 Mbytes)	N/A
NT5D03EA	Call Processor Card (112 Mbytes)	N/A
NT5D03FA	Call Processor Card (128 Mbytes)	N/A
NT5D10AA	Call Processor Card (48 Mbytes)	N/A
NT5D10CA	Call Processor Card (64 Mbytes)	N/A
NT5D10EA	Call Processor Card (80 Mbytes)	N/A
NT5D10JA	Call Processor Card (112 Mbytes)	N/A

Table 4
Failure rates of circuit cards (Part 2 of 6)

Order code	Description	Failure rate per 10^6 hrs
NT5D11 NT5D14	Line side T1 Line Card	N/A
NT5D12AA	Dual DTI/PRI Card (DDP)	1.76
NT5K02	Flexible Analog Line Card	6.0
NT5K07	Universal Trunk Card for Hong Kong	4.3
NT5K09	Quad Density Receiver	1.5
NT5K10	Enhanced Dual Loop Buffer Card	1.0
NT5K17	Enhanced Dual Loop Buffer Card	1.9
NT5K18	Extended PPM CO Trunk Card	3.5
NT5K19	E&M/2280 Hz Trunk Card	2.2
NT5K20	Extended Tone Detector	2.2
NT5K21	XMFC/MFE Sender Receiver card	2.7
NT5K36	Direct Inward Dial/Direct Outward Dial Trunk Card for Germany	19.0
NT5K70	Central Office Trunk Card for Germany (8 units)	4.6
NT5K71	Central Office Trunk Card for Germany (4 units)	4.6
NT5K72	E&M Trunk Card for Germany	19.0
NT5K82	Central Office Trunk Card	4.6
NT5K83	E&M Trunk Card for Switzerland	19.0
NT5K83AA	E&M Trunk Card for Denmark	2.5
NT5K83CA	E&M Trunk Card for Norway	2.5
NT5K83DA	E&M Trunk Card for Holland	19.0

Table 4
Failure rates of circuit cards (Part 3 of 6)

Order code	Description	Failure rate per 10^6 hrs
NT5K83EA	E&M Trunk Card for Australia	2.5
NT5K84AA	Direct Inward Dial Trunk Card for Switzerland	2.5
NT5K84BA	Direct Inward Dial Trunk Card for Australia	4.6
NT5K93	Central Office Trunk Card for Norway	4.6
NT5K99	Central Office Trunk Card for Spain	4.6
NT5K96	Flexible Analog Line Card without Message Waiting	6.0
NT6D6003	Core Bus Terminator Card	0.23
NT6D65	Core to Network Interface Card	3.00
NT6D80AA	Multi-purpose Serial Data Link Card	4.47
NT7D16	Data Access Card	4.07
NT7R51	Local Carrier Interface Card	2.40
NT7R52	Remote Carrier Interface Card	1.80
NT8D01AC NT8D01BC NT8D01AD NT8D01BA	Controller-4 Card Controller-4 Card SMT Controller-2 Card Controller-2 Card	7.00 1.86 6.50 1.86
NT8D02	Digital Line Card	1.80
NT8D03	Analog Line Card	5.10
NT8D04BA	Superloop Network Card	2.32
NT8D09	Analog Message Waiting Line Card	5.80
NT8D14	Universal Trunk Card	3.40

Table 4
Failure rates of circuit cards (Part 4 of 6)

Order code	Description	Failure rate per 10^6 hrs
NT8D15	E&M Trunk Card	3.70
NT8D16	Digitone Receiver Card	2.70
NT8D17	Conference/TDS Card	5.10
NT8D18	Network/DTR Card	7.30
NT8D41BA	Quad Serial Data Interface Paddle Board	164.0
NT8D72AB	2048 kbps Primary Rate Interface	5.62
NT9D19AA	Call Processor Card (48 MB)	11.95
NT9D19CA	Call Processor Card (64 MB)	12.10
NT9D19HA	Call Processor Card (96 MB)	12.25
NT9D34	Enhanced Mass Storage Interface Card	2.26
NTAG03	Central Office Trunk Card for Holland	19.0
NTAG04	Central Office/Direct Inward Dial Trunk Card for Holland	19.0
NTAG26	Extended Multi-frequency Receiver	TBD
NTBK51	Downloadable D-Channel Daughterboard	1.24
NTCK16	Generic Central Office Trunk Card	4.6
NTND01	Integrated CPU/Memory Card (6 MB)	5.80
NTND01	Integrated CPU/Memory Card (12 MB)	5.90
QPC43	Peripheral Signaling Card	1.73
QPC71	E&M/DX/Paging Trunk Card	3.10
QPC250	Release Link Trunk Card	7.73

Table 4
Failure rates of circuit cards (Part 5 of 6)

Order code	Description	Failure rate per 10^6 hrs
QPC311	Data Line Card (SL-1) — vintage F and later	13.91 8.26
QPC327	MFC Sender/Receiver Card	20.07
QPC343	Ground Button Recall Line Card (A-Law)	12.50
QPC353	Modem Pool Line Card (μ-Law)	8.23
QPC354	Modem Pool Line Card (A-Law)	6.26
QPC397	MCDS Asynchronous Card	12.68
QPC414	Network Card	3.00
QPC422	Tone Detector Card	17.40
QPC430	Asynchronous Interface Line Card	22.82
QPC432	4-Port Data Line Card	8.15
QPC441	Three-Port Extender Card	2.00
QPC449	Loop Signaling Trunk Card	2.27
QPC450	CO/FX/WATS Trunk Card	3.34
QPC451	SL-1 Line Card	5.15
QPC471	Clock Controller Card — vintage H and later	2.44 1.00
QPC494	500/2500 Message Waiting Card	8.00
QPC526	PPM CO Trunk Card (A-law)	16.82
QPC527	CO/FX/WATS Trunk Card (A-law)	12.37
QPC532	Ground Button Line Card	13.93
QPC540	Tone Detector Card	6.49

Table 4
Failure rates of circuit cards (Part 6 of 6)

Order code	Description	Failure rate per 10^6 hrs
QPC574	Digitone Receiver Card	0.83
QPC578	Integrated Services Digital Line Card	2.72
QPC594	500/2500 Line Card	3.70
QPC595	Dual DT Receiver Card (A-law)	6.28
QPC602	ROM Card	3.20
QPC609	Tone and Digit Switch Card	2.33
QPC628	CO Loop Start Supervisory Trunk Card	7.41
QPC659	Dual Loop Peripheral Buffer Card	2.75
QPC720	Primary Rate Interface Card	6.00
QPC841	Four-Port Serial Data Interface Card	2.30

Table 5
Failure rates of mass storage equipment

Order code	Description	Failure rate per 10^6 hrs
QMM43	Mass Storage Unit	53.59
QMM45	Mass Storage Unit	45.70
QMT102	Disk Drive Controller	3.23
QMT103	Hard Disk Drive	16.31
QMT104	Floppy Disk Drive	22.83
QPC584	Mass Storage Interface Card	2.26
QPC742	Floppy Disk Interface Card	3.23
QUW1	Magnetic Tape Unit	48.00
QUW9	Magnetic Tape Unit	20.58

Table 6
Failure rates of station equipment

Order code	Description	Failure rate per 10^6 hrs
NE-500/2500	500/2500 Telephone	N/A
NE-DGQC-35	Line Cord	3.50
NE-G3AR-35	Handset	0.50
NE-G3DRN-3	Console Handset	0.50
NE-T1	Transmitter	0.50
NE-U1	Receiver	0.50
NTZK06	M2006 Telephone	3.08
NTZK08	M2008 Telephone	3.10
NTZK16	M2616 Telephone	3.88
NTZK20	M2016S Telephone	5.87
NTZK22	M2216ACD-1 Telephone	4.68
NT6G00	M2250 TCM Console	N/A
QMT11	Asynchronous/Synchronous Interface Module	6.34
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QPF23	Terminating Plug	0.16

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